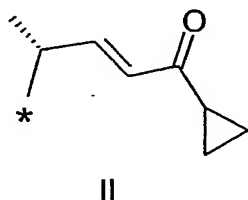
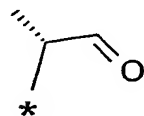


CLAIMS

1. A method of preparing a compound of general structure II,

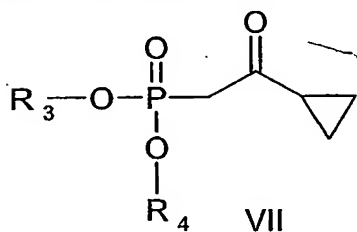


5 wherein the carbon marked with an asterisk is either connected by a single bond to a carbon atom of a vitamin D analogue fragment at C-17 or to a fragment of a precursor for the synthesis of a vitamin D analogue at a C-17 analogous position, the method comprising reacting a compound of general structure IIa,



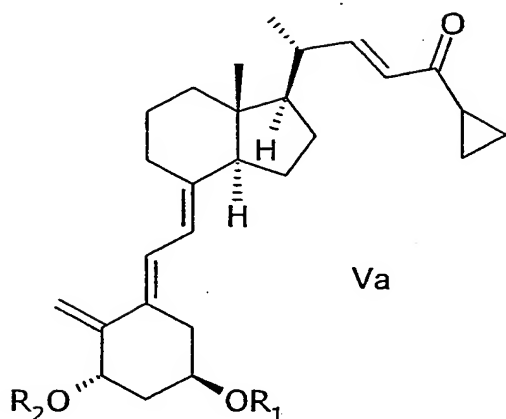
11a

10. wherein the carbon marked with an asterisk is either connected by a single bond to a carbon atom of a vitamin D analogue fragment at C-17 or to a fragment of a precursor for the synthesis of a vitamin D analogue at a C-17 analogous position, with a phosphonate of general structure VII,



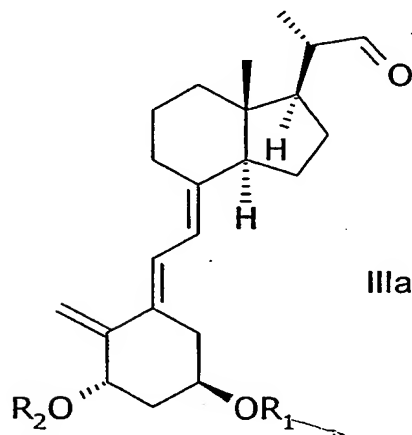
15 wherein R₃ and R₄ are the same or different and represent alkyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, or aryl, each being optionally substituted with one or more substituents selected from the group consisting of alkyl, aralkyl, cycloalkyl, cycloalkenyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, aryl, oxo, alkoxycarbonyl, alkylcarbonyloxy, halogen, alkoxy, carboxy, sulfo or
20 hydroxy,
in the presence of a base.

2. A method according to claim 1 of preparing a compound of general structure Va,

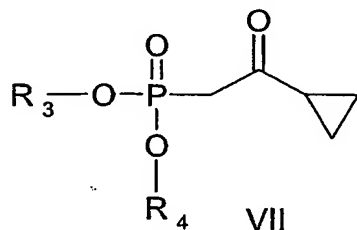


wherein R₁ and R₂ are the same or different and each represent hydrogen or a hydroxy protecting group,

the method comprising reacting a compound of general structure IIIa,



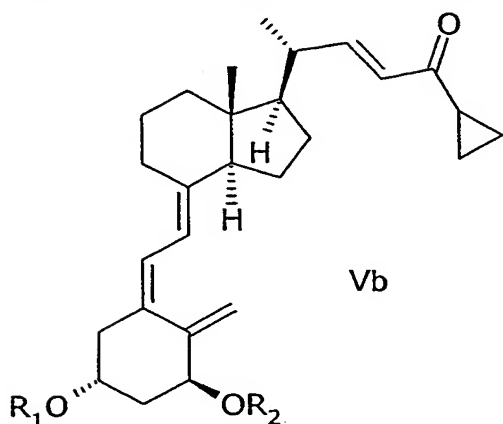
wherein R₁ and R₂ are as defined above,
with a phosphonate of general structure VII,



wherein R₃ and R₄ are the same or different and represent alkyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, or aryl, each being optionally substituted with one or more substituents selected from the group consisting of alkyl, aralkyl, cycloalkyl, cycloalkenyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, aryl, oxo, alkoxy, carboxy, sulfo or hydroxy,

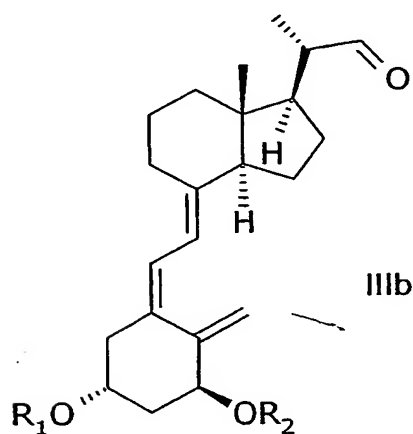
in the presence of a base.

3. A method according to claim 1 of preparing a compound of general structure Vb,



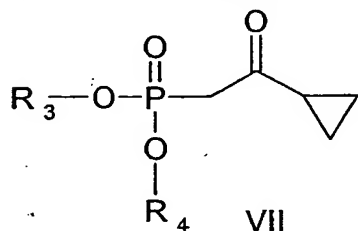
wherein R_1 and R_2 are the same or different and each represent hydrogen or a hydroxy protecting group,

the method comprising reacting a compound of general structure IIIb,



wherein R_1 and R_2 are as defined above,

with a phosphonate of general structure VII,

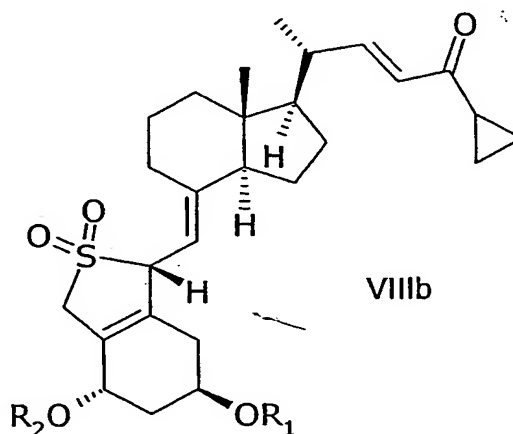
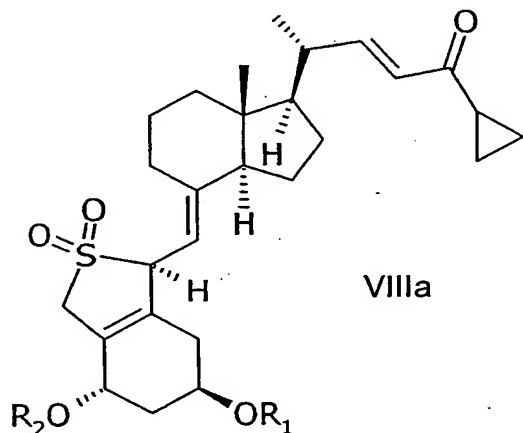


wherein R_3 and R_4 are the same or different and represent alkyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, or aryl, each being optionally substituted with one or more substituents selected from the group consisting of alkyl, aralkyl, cycloalkyl, cycloalkenyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl,

aralkynyl, aryl, oxo, alkoxy carbonyl, alkyl carbonyloxy, halogen, alkoxy, carboxy, sulfo or hydroxy,

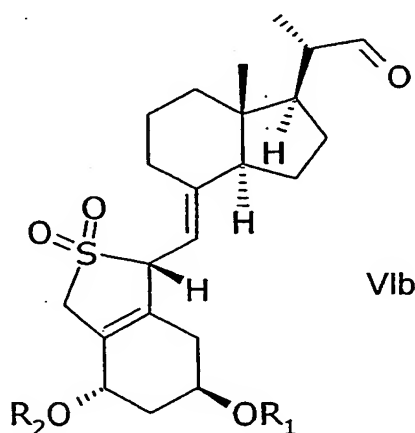
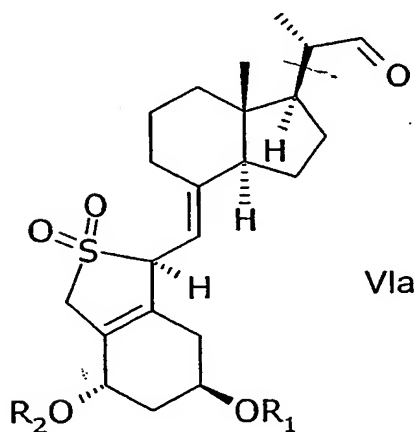
in the presence of a base.

- 5 4. A method according to claim 1 of preparing a compound of general structure VIIIa or VIIIb respectively,

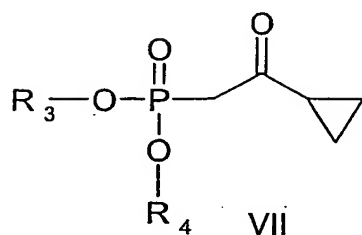


wherein R_1 and R_2 are the same or different and each represent hydrogen or a hydroxy protecting group,

- 10 the method comprising reacting a compound of general structure VIa or VIb respectively,

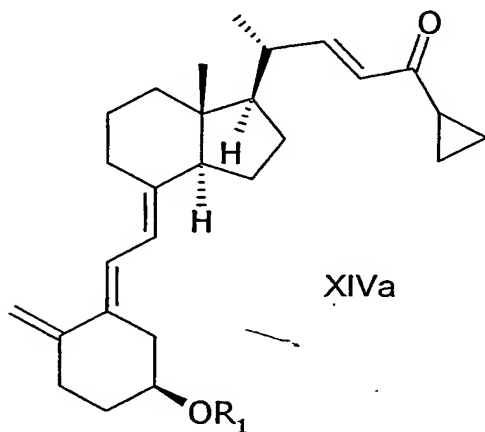


wherein R_1 and R_2 are as defined above,
with a phosphonate of general structure VII,

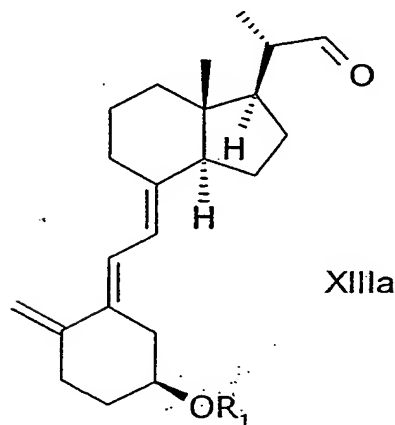


wherein R_3 and R_4 are the same or different and represent alkyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, or aryl, each being optionally substituted with one or more substituents selected from the group consisting of alkyl, aralkyl, cycloalkyl, cycloalkenyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, aryl, oxo, alkoxy, alkoxy, carboxy, sulfo or hydroxy, in the presence of a base.

5. A method according to claim 1 of preparing a compound of general structure XIVa,

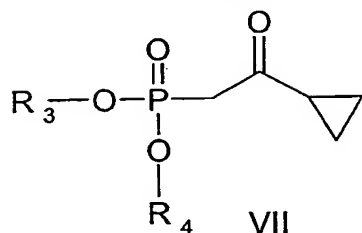


wherein R_1 represents hydrogen or a hydroxy protecting group, the method comprising reacting a compound of general structure XIIIa,



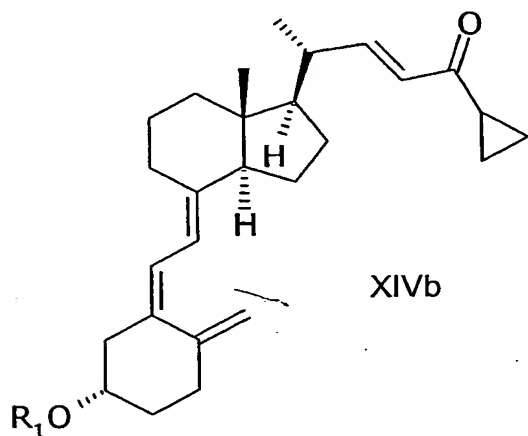
- wherein R_1 is as defined above,

with a phosphonate of general structure VII,

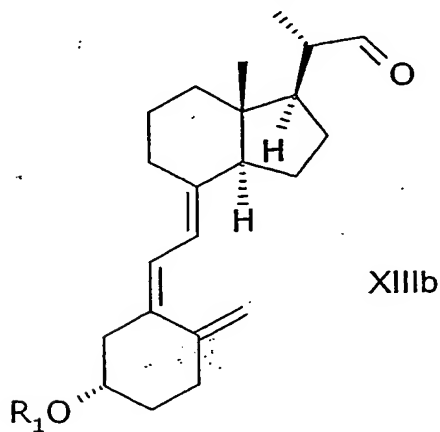


wherein R_3 and R_4 are the same or different and represent alkyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, or aryl, each being optionally substituted with one or more substituents selected from the group consisting of alkyl, aralkyl, cycloalkyl, cycloalkenyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, aryl, oxo, alkoxycarbonyl, alkylcarbonyloxy, halogen, alkoxy, carboxy, sulfo or hydroxy, in the presence of a base.

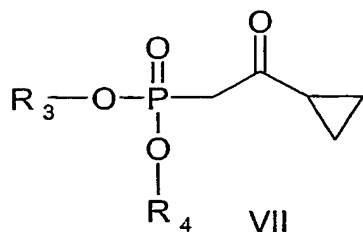
6. A method according to claim 1 of preparing a compound of general structure XIVb,



wherein R_1 represents hydrogen or a hydroxy protecting group, the method comprising reacting a compound of general structure XIIIb,



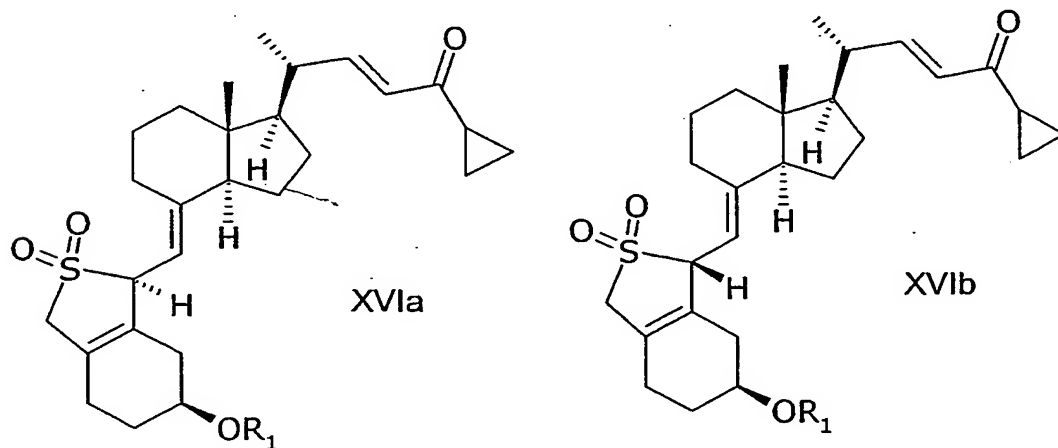
wherein R_1 is as defined above,
with a phosphonate of general structure VII,



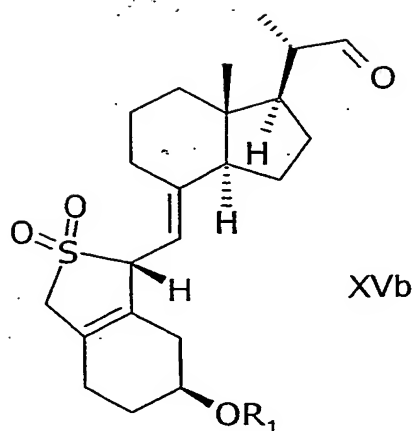
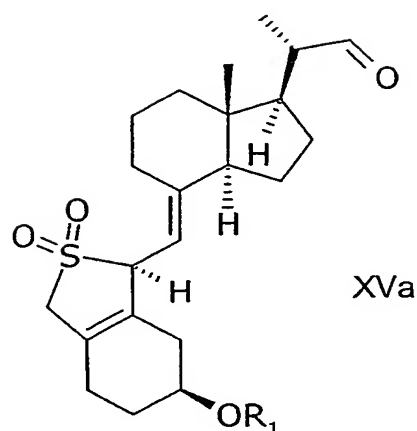
wherein R_3 and R_4 are the same or different and represent alkyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, or aryl, each being optionally substituted with one or more substituents selected from the group consisting of alkyl, aralkyl, cycloalkyl, cycloalkenyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, aryl, oxo, alkoxycarbonyl, alkylcarbonyloxy, halogen, alkoxy, carboxy, sulfo or hydroxy,

in the presence of a base.

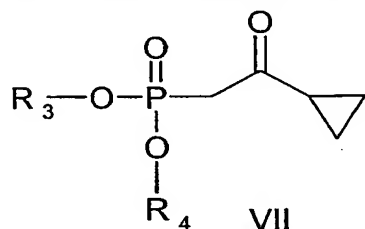
7. A method according to claim 1 of preparing a compound of general structure XVIa or XVIb respectively,



wherein R_1 represents hydrogen or a hydroxy protecting group,
the method comprising reacting a compound of general structure XVa or XVb respectively,

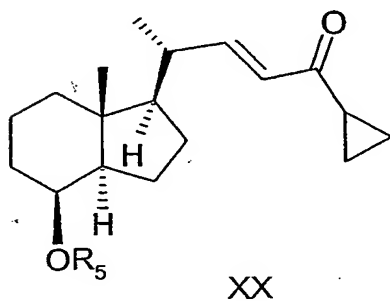


wherein R_1 is as defined above,
with a phosphonate of general structure VII,

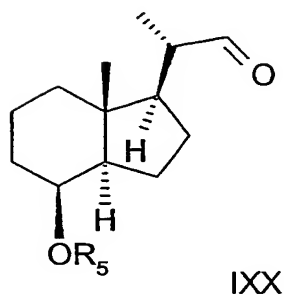


- 5 wherein R_3 and R_4 are the same or different and represent alkyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, or aryl, each being optionally substituted with one or more substituents selected from the group consisting of alkyl, aralkyl, cycloalkyl, cycloalkenyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, aryl, oxo, alkoxycarbonyl, alkylcarbonyloxy, halogen, alkoxy, carboxy, sulfo or
10 hydroxy,
in the presence of a base.

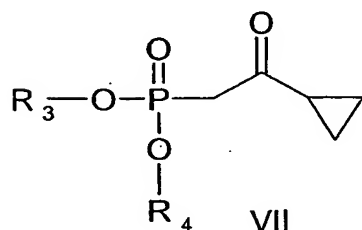
8. A method according to claim 1 of preparing a compound of general structure XX,



- 15 wherein R_5 represents hydrogen or a hydroxy protecting group,
the method comprising reacting a compound of general structure IXX,



wherein R₅ is as defined above,
with a phosphonate of general structure VII,



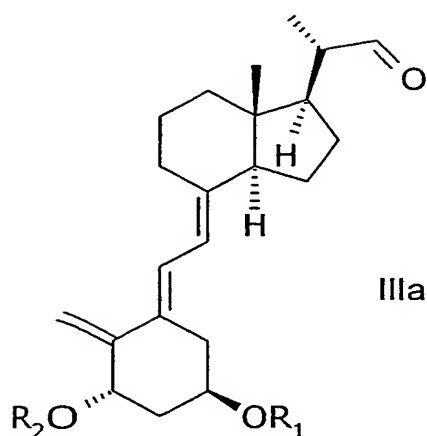
- 5 wherein R₃ and R₄ are the same or different and represent alkyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, or aryl, each being optionally substituted with one or more substituents selected from the group consisting of alkyl, aralkyl, cycloalkyl, cycloalkenyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, aryl, oxo, alkoxy, carbonyl, alkylcarbonyloxy, halogen, alkoxy, carboxy, sulfo or
- 10 hydroxy,
in the presence of a base.

9. A method of preparing calcipotriol or calcipotriol monohydrate, the method comprising the method according to any one of claims 1, 2, 3, 4, 5, 6, 7, or 8.

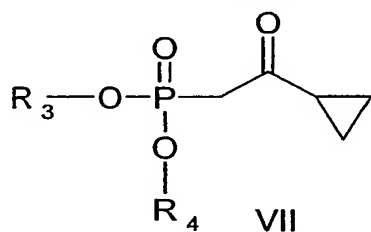
15

10. A method for producing calcipotriol or calcipotriol monohydrate, the method comprising the steps of:

(i) reacting a compound of general structure IIIa,



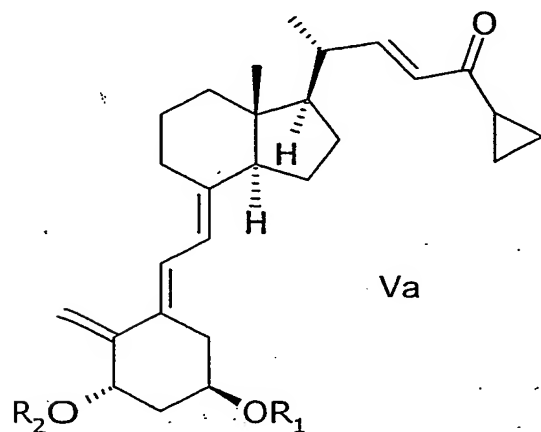
wherein R₁ and R₂ are the same or different and represent hydrogen or a hydroxy protecting group,
with a phosphonate of general structure VII,



wherein R₃ and R₄ are the same or different and represent alkyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, or aryl, each being optionally substituted with one or more substituents selected from the group consisting of alkyl, aralkyl, cycloalkyl, cycloalkenyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, aryl, oxo, alkoxy, carbonyl, alkylcarbonyloxy, halogen, alkoxy, carboxy, sulfo or hydroxy,

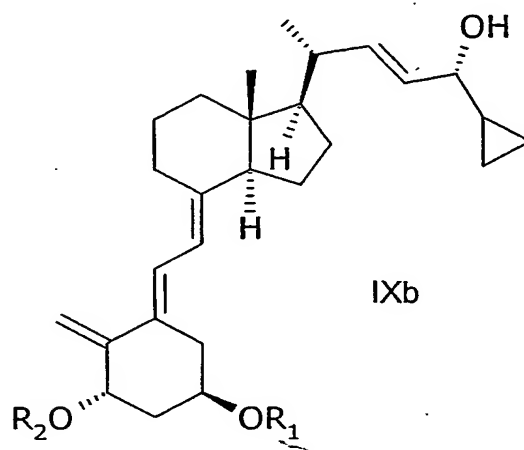
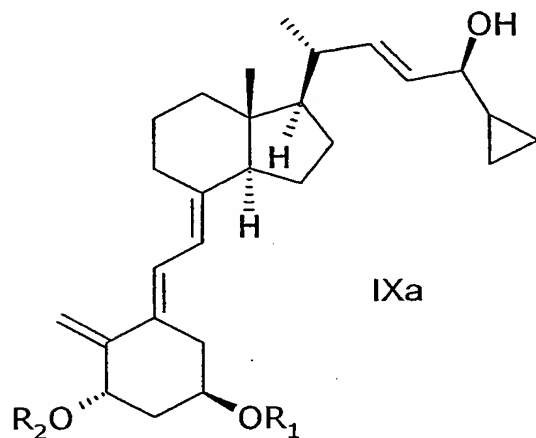
in the presence of a base,

to give a compound of general structure Va,



wherein R_1 and R_2 are as defined above;

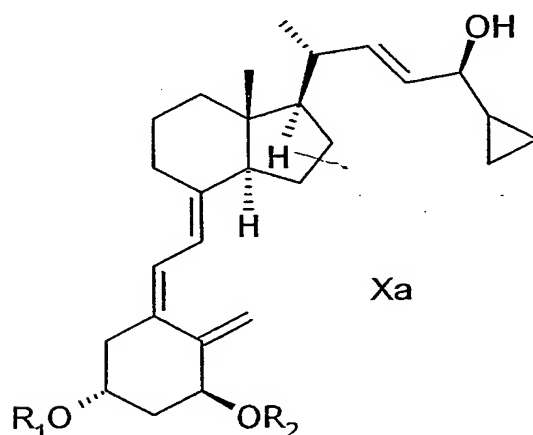
(ii) reducing the compound of general structure V_a with a suitable reducing agent, to give a compound of general structure IX_a or a mixture of compounds of general structure IX_a and IX_b,



5 wherein R₁ and R₂ are as defined above;

(iii) optionally separating the compound of general structure IX_a from the mixture of compounds of general structure IX_a and IX_b;

(iv) photoisomerising the compound of general structure IX_a to the compound of general structure X_a,



10

wherein R₁ and R₂ are as defined above;

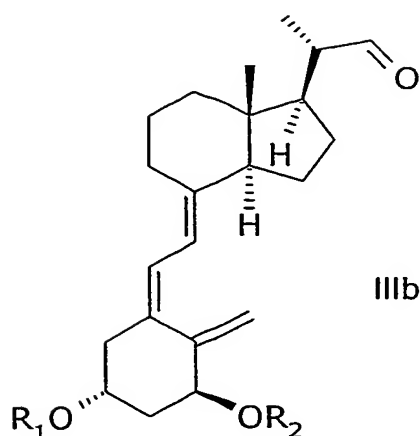
(v) when R₁ and/or R₂ are not hydrogen, removing the hydroxy protecting group(s) R₁ and/or R₂ of the compound of general structure X_a to generate calcipotriol; and

(vi) optionally crystallising the calcipotriol from a mixture of an organic solvent and water to give calcipotriol monohydrate.

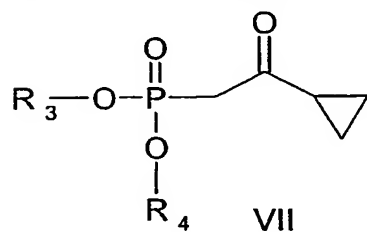
15

11. A method for producing calcipotriol or calcipotriol monohydrate, the method comprising the steps of:

(i) reacting a compound of general structure III_b,



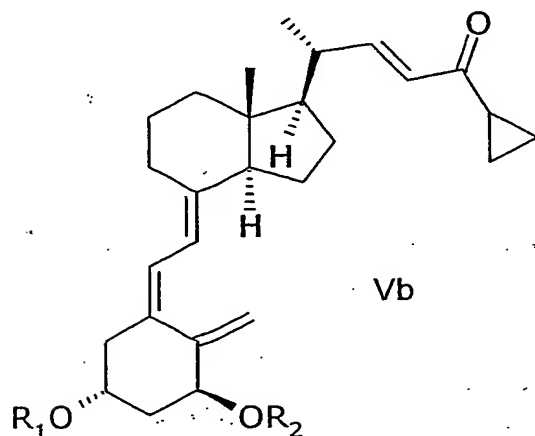
wherein R_1 and R_2 are the same or different and represent hydrogen or a hydroxy protecting group,
with a phosphonate of general structure VII,



wherein R_3 and R_4 are the same or different and represent alkyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, or aryl, each being optionally substituted with one or more substituents selected from the group consisting of alkyl, aralkyl, cycloalkyl, cycloalkenyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, aryl, oxo, alkoxycarbonyl, alkylcarbonyloxy, halogen, alkoxy, carboxy, sulfo or hydroxy,

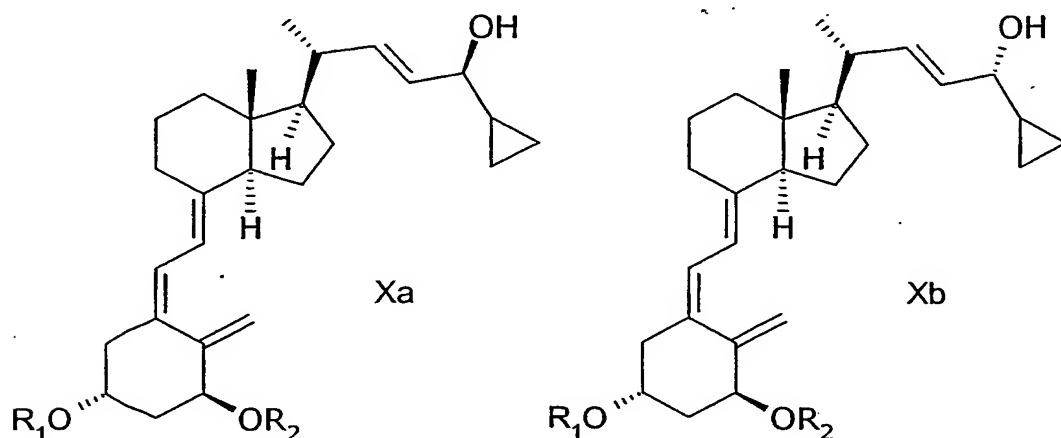
in the presence of a base,

to give a compound of general structure Vb,



wherein R_1 and R_2 are as defined above;

(ii) reducing the compound of general structure Vb with a suitable reducing agent, to give a compound of general structure Xa or a mixture of compounds of general structure Xa and Xb,



5 wherein R_1 and R_2 are as defined above;

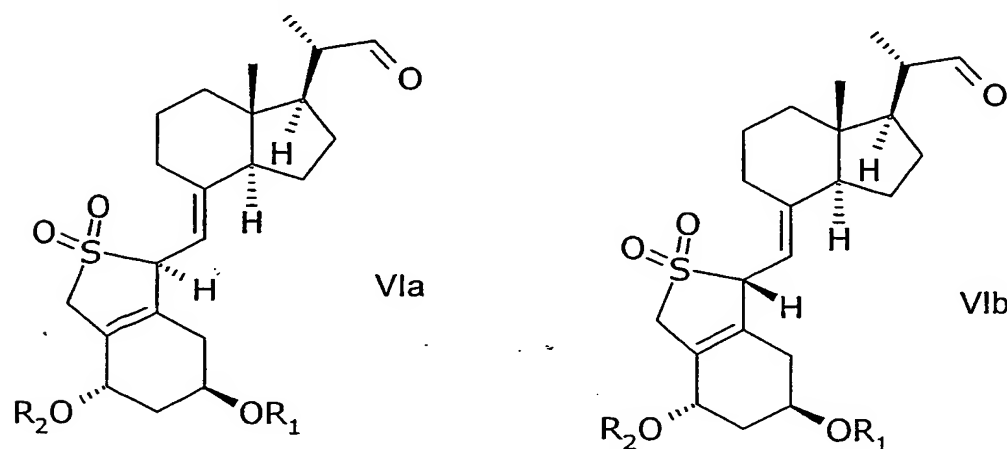
(iii) optionally separating the compound of general structure Xa from the mixture of compounds of general structure Xa and Xb;

(iv) when R_1 and/or R_2 are not hydrogen, removing the hydroxy protecting group(s) R_1 and/or R_2 of the compound of general structure Xa to generate calcipotriol; and

10 (v) optionally crystallising the calcipotriol from a mixture of an organic solvent and water to give calcipotriol monohydrate.

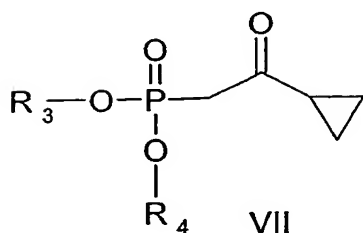
12. A method for producing calcipotriol or calcipotriol monohydrate, the method comprising the steps of:

15 (i) reacting a compound of general structure VIa and/or VIb,



wherein R_1 and R_2 are the same or different and represent hydrogen or a hydroxy protecting group,

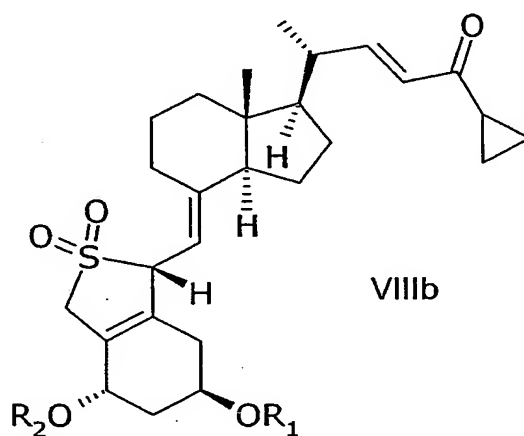
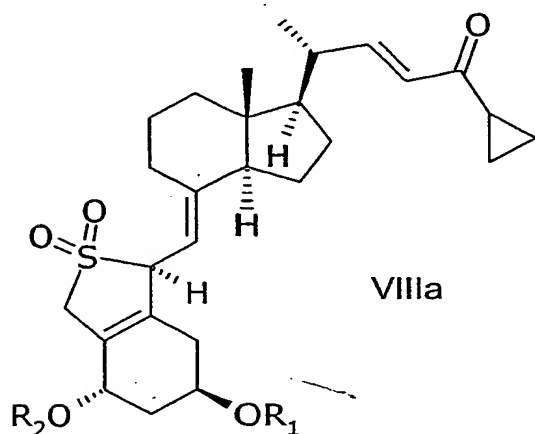
with a phosphonate of general structure VII,



wherein R_3 and R_4 are the same or different and represent alkyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, or aryl, each being optionally substituted with one or more substituents selected from the group consisting of alkyl, aralkyl, cycloalkyl, cycloalkenyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, aryl, oxo, alkoxy, carbonyloxy, halogen, alkoxy, carboxy, sulfo or hydroxy,

in the presence of a base,

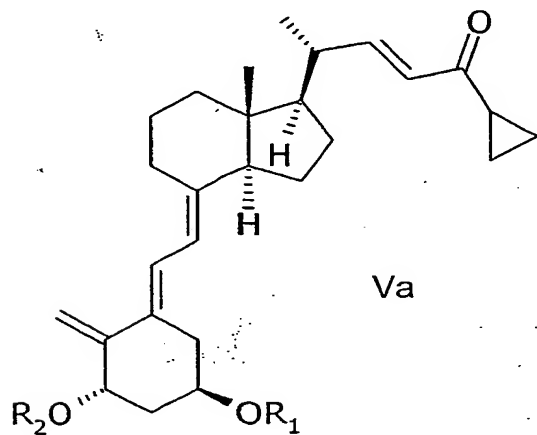
to give a compound of general structure VIIIa and/or VIIIb,



wherein R_1 and R_2 are as defined above;

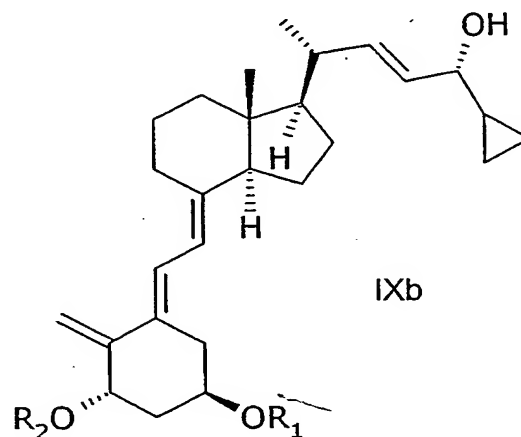
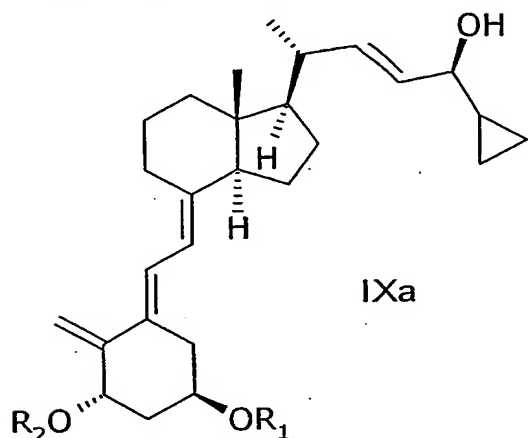
(ii) heating the compounds of general structure VIIIa and/or VIIIb above 60°C in the presence of a base,

to give a compound of general structure Va,



wherein R_1 and R_2 are as defined above;

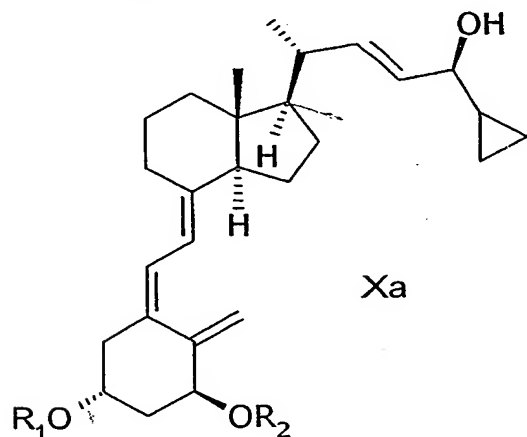
(iii) reducing the compound of general structure Va with a suitable reducing agent, to give a compound of general structure IXa or a mixture of compounds of general structure IXa and IXb,



wherein R_1 and R_2 are as defined above;

(iv) optionally separating the compound of general structure IXa from the mixture of compounds of general structure IXa and IXb;

(v) photoisomerising the compound of general structure IXa to the compound of general structure Xa,



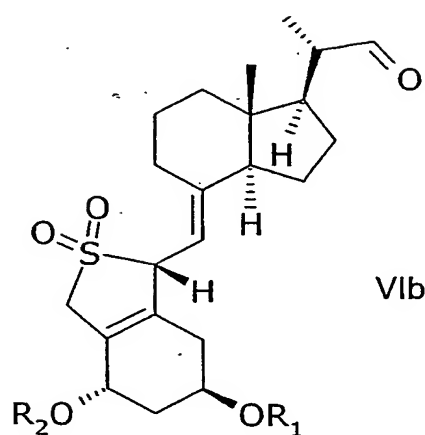
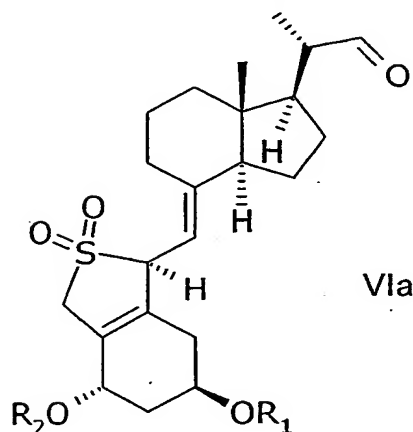
wherein R_1 and R_2 are as defined above;

(vi) when R_1 and/or R_2 are not hydrogen, removing the hydroxy protecting group(s) R_1 and/or R_2 of the compound of general structure Xa to generate calcipotriol; and

(vii) optionally crystallising the calcipotriol from a mixture of an organic solvent and water to give calcipotriol monohydrate.

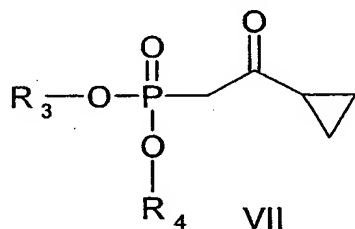
13. A method for producing calcipotriol or calcipotriol monohydrate, the method comprising the steps of:

(i) reacting a compound of general structure VIa and/or VIb,



wherein R_1 and R_2 are the same or different and represent hydrogen or a hydroxy protecting group,

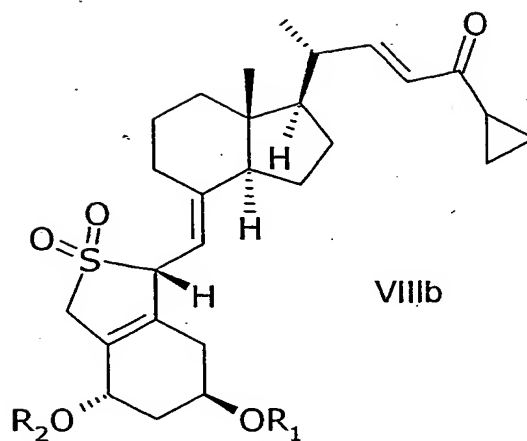
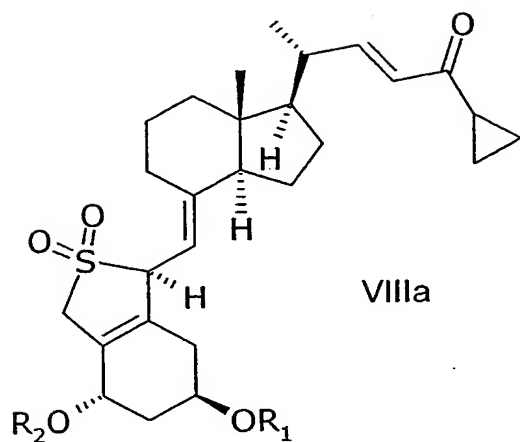
5 with a phosphonate of general structure VII,



wherein R_3 and R_4 are the same or different and represent alkyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, or aryl, each being optionally substituted with one or more substituents selected from the group consisting of alkyl, aralkyl, cycloalkyl, cycloalkenyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, aryl, oxo, alkoxy, alkoxy, carboxy, sulfo or hydroxy,

10 in the presence of a base,

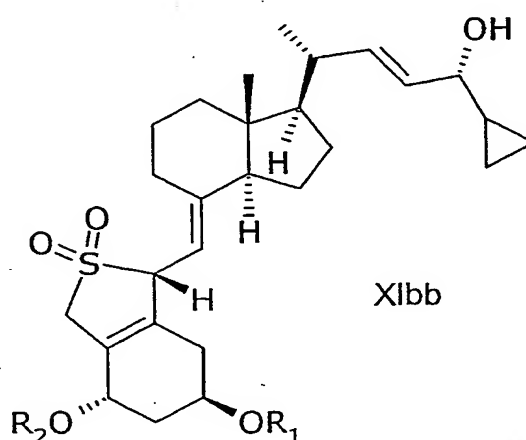
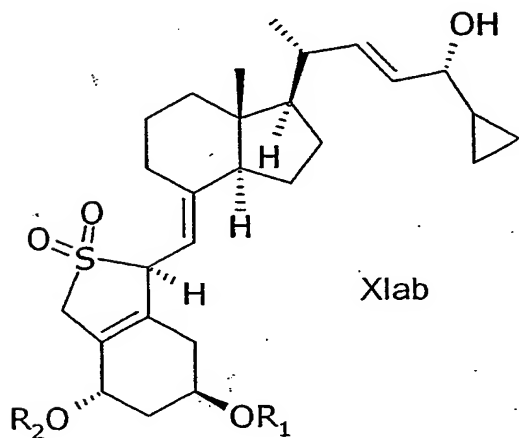
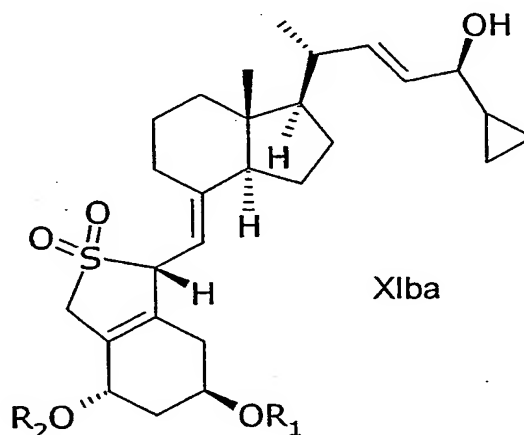
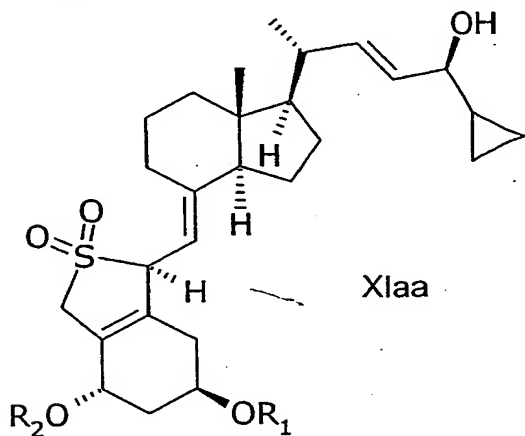
to give a compound of general structure VIIIa and/or VIIIb,



wherein R_1 and R_2 are as defined above;

(ii) reducing the compounds of general structure VIIIa and/or VIIIb, with a suitable reducing agent in an inert solvent,

- 5 to give compounds of general structure XIa and/or XIb, or a mixture of compounds of general structure XIa and/or XIb and XIab and/or XIbb,



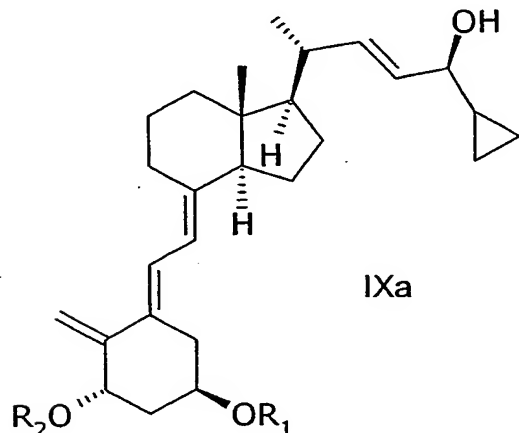
wherein R_1 and R_2 are as defined above;

(iii) optionally separating the compounds of general structure XIa and/or XIb from the reaction mixture;

(iv) heating the compounds of general structure XIa and/or XIb above 60°C in the

5 presence of a base,

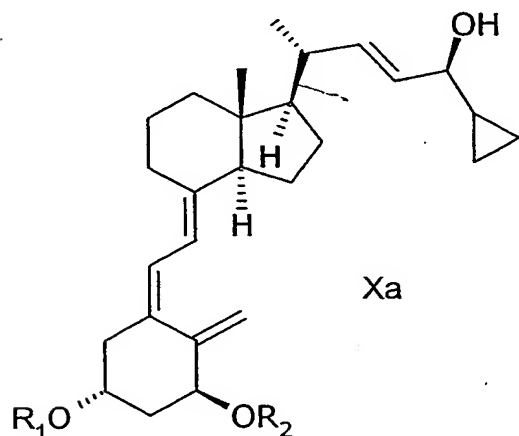
to give a compound of general structure IXa,



wherein R_1 and R_2 are as defined above;

(v) optionally separating the compound of general IXa from the reaction mixture;

10 (vi) photoisomerising the compound of general structure IXa to the compound of general structure Xa,



wherein R_1 and R_2 are as defined above;

(vii) when R_1 and/or R_2 are not hydrogen, removing the hydroxy protecting group(s) R_1 and/or R_2 of the compound of general structure Xa to generate calcipotriol; and

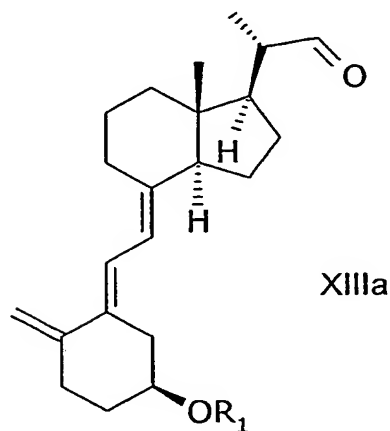
15

(viii) optionally crystallising the calcipotriol from a mixture of an organic solvent and water to give calcipotriol monohydrate;

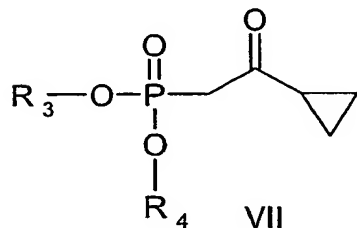
wherein steps (vi) and (vii) may be in reversed order.

14. A method for producing calcipotriol or calcipotriol monohydrate, the method comprising the steps of:

(i) reacting a compound of general structure XIIIa,

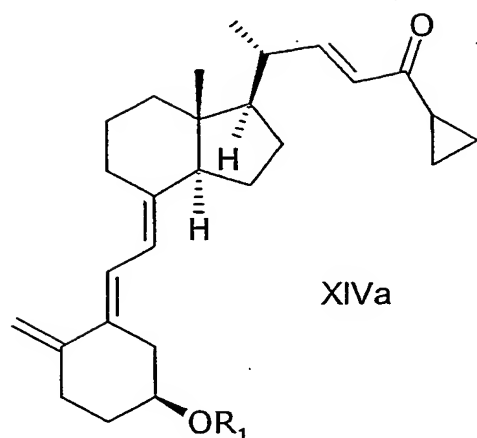


5 wherein R₁ represents hydrogen or a hydroxy protecting group,
with a phosphonate of general structure VII,



wherein R₃ and R₄ are the same or different and represent alkyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, or aryl, each being optionally substituted with one or more substituents selected from the group consisting of alkyl, aralkyl, cycloalkyl, cycloalkenyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, aryl, oxo, alkoxycarbonyl, alkylcarbonyloxy, halogen, alkoxy, carboxy, sulfo or hydroxy,

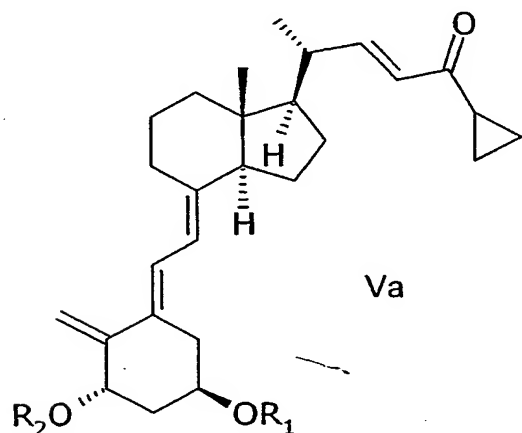
10 in the presence of a base,
15 to give a compound of general structure XIVa,



wherein R_1 is as defined above;

(ii) hydroxylating the compound of general structure XIVa with suitable hydroxylating agent,

5 to give a compound of general structure Va,



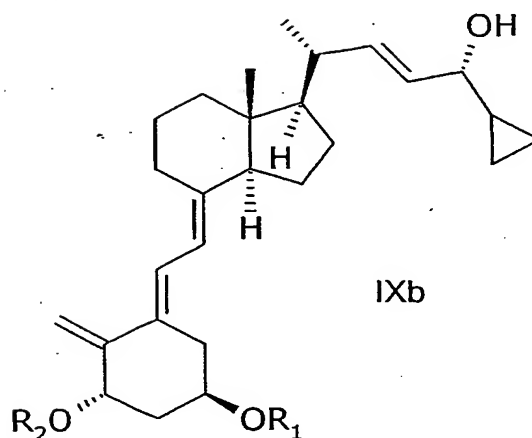
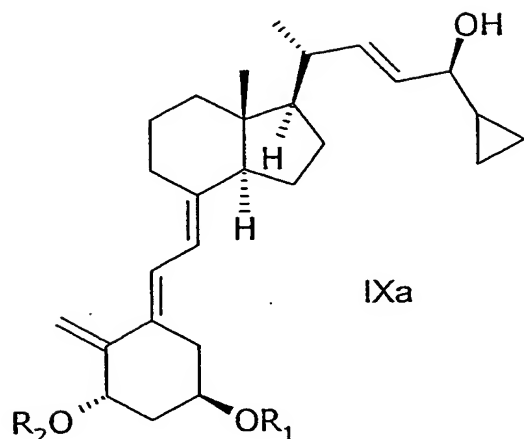
wherein R_1 represents hydrogen or a hydroxy protecting group and R_2 is hydrogen;

(iii) optionally reacting the compound of general structure Va, wherein R_1 represents hydrogen or a hydroxy protecting group and R_2 is hydrogen with a suitable protecting agent,

10 to give a compound of general structure Va, wherein R_1 and R_2 are the same or different and represent a hydroxy protecting group;

(iv) reducing the compound of general structure Va with a suitable reducing agent, to give a compound of general structure IXa or a mixture of compounds of general structure IXa and IXb,

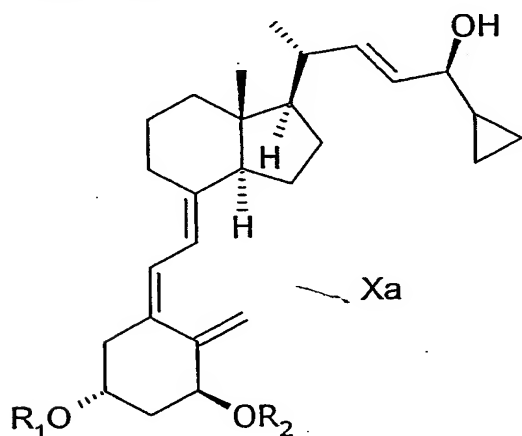
15



wherein R_1 and R_2 are as defined above;

(v) optionally separating the compound of general structure IXa from the mixture of compounds of general structure IXa and IXb;

- 5 (vi) photoisomerising the compound of general structure IXa to a compound of general structure Xa,

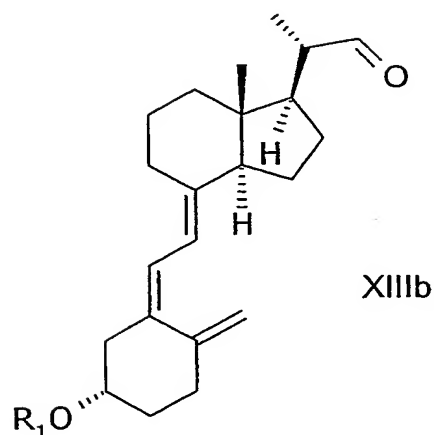


wherein R_1 and R_2 are as defined above;

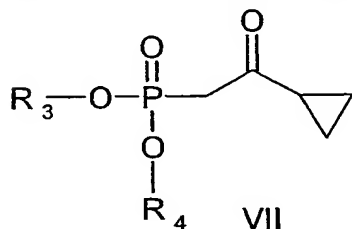
- 10 (vii) when R_1 and/or R_2 are not hydrogen, removing the hydroxy protecting group(s) R_1 and/or R_2 of the compound of general structure Xa to generate calcipotriol; and
 (viii) optionally crystallising the calcipotriol from a mixture of an organic solvent and water to give calcipotriol monohydrate.

- 15 15. A method for producing calcipotriol or calcipotriol monohydrate, the method comprising the steps of:

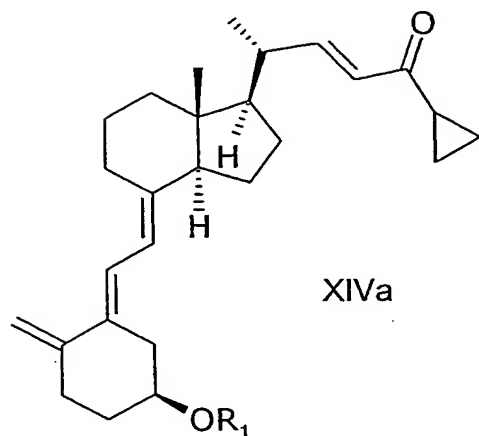
(i) reacting a compound of general structure XIIIb,



wherein R_1 represents hydrogen or a hydroxy protecting group,
with a phosphonate of general structure VII,



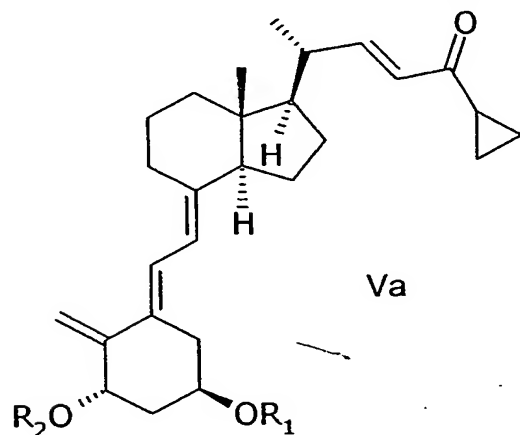
- 5 wherein R_3 and R_4 are the same or different and represent alkyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, or aryl, each being optionally substituted with one or more substituents selected from the group consisting of alkyl, aralkyl, cycloalkyl, cycloalkenyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, aryl, oxo, alkoxycarbonyl, alkylcarbonyloxy, halogen, alkoxy, carboxy, sulfo or
- 10 hydroxy,
- in the presence of a base,
- to give a compound of general structure XIVb,
- wherein R_1 is as defined above;
- (ii) photoisomerising the compound of general structure XIVb to a compound of general
- 15 structure XIVa,



wherein R_1 is as defined above;

(iii) hydroxylating the compound of general structure XIVa with suitable hydroxylating agent,

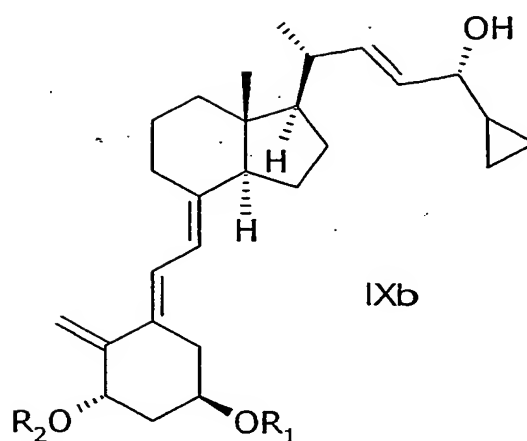
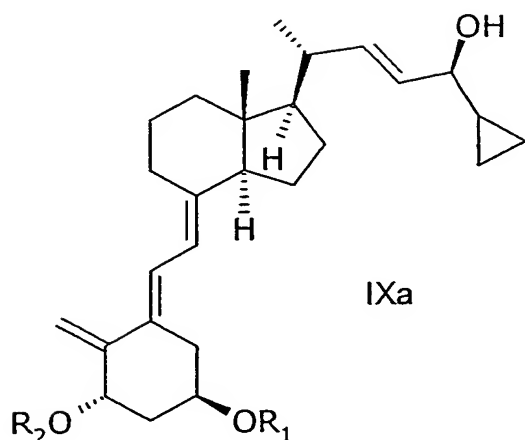
5 to give a compound of general structure Va,



wherein R_1 represents hydrogen or a hydroxy protecting group and R_2 is hydrogen;

(iv) optionally reacting the compound of general structure Va, wherein R_1 represents hydrogen or a hydroxy protecting group and R_2 is hydrogen with a suitable protecting agent to give a compound of general structure Va, wherein R_1 and R_2 are the same or different and represent a hydroxy protecting group;

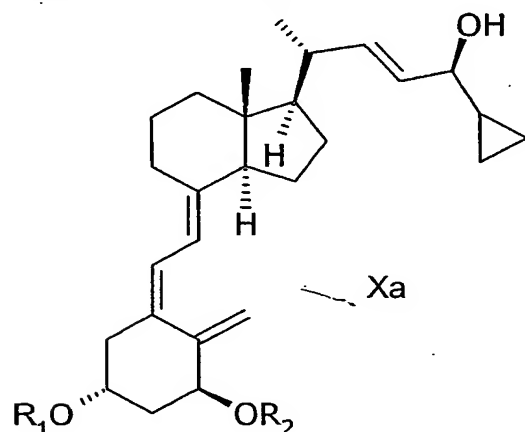
(v) reducing the compound of general structure Va with a suitable reducing agent, to give a compound of general structure IXa or a mixture of compounds of general structure IXa and IXb,



wherein R_1 and R_2 are as defined above;

(vi) optionally separating the compound of general structure IXa from the mixture of compounds of general structure IXa and IXb;

- 5 (vii) photoisomerising the compound of general structure IXa to the compound of general structure Xa,

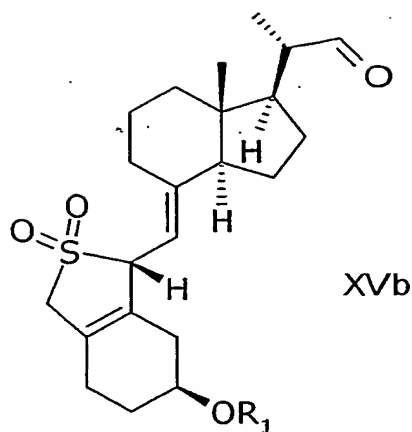
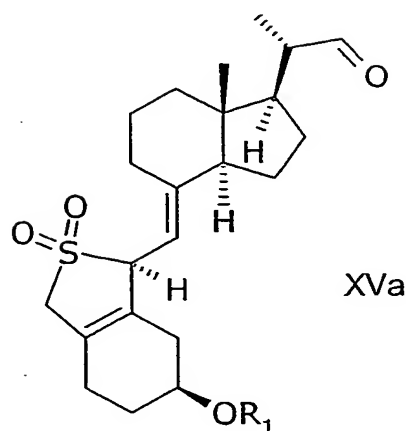


wherein R_1 and R_2 are as defined above;

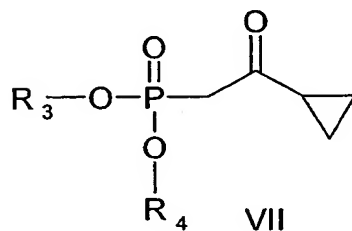
- 10 (viii) when R_1 and/or R_2 are not hydrogen, removing the hydroxy protecting group(s) R_1 and/or R_2 of the compound of general structure Xa to generate calcipotriol; and
 (ix) optionally crystallising the calcipotriol from a mixture of an organic solvent and water to give calcipotriol monohydrate.

- 15 16. A method for producing calcipotriol or calcipotriol monohydrate, the method comprising the steps of:

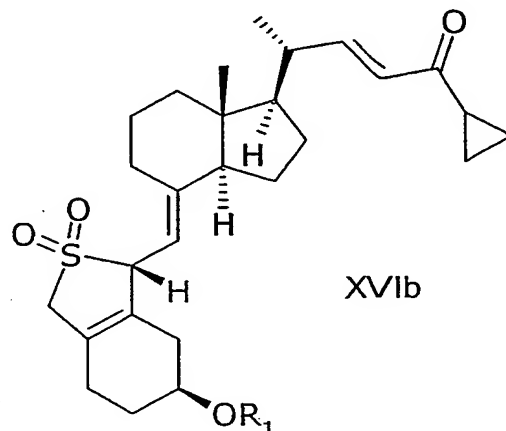
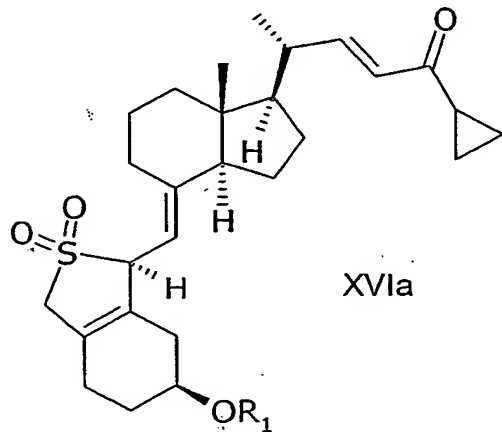
(i) reacting a compound of general structure XVa and/or XVb,



wherein R₁ represents a hydrogen or a hydroxy protecting group,
with a phosphonate of general structure VII,

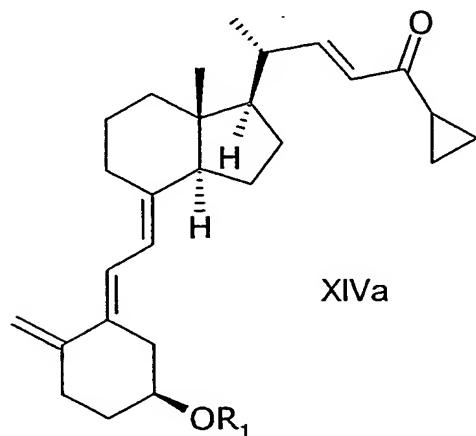


- 5 wherein R₃ and R₄ are the same or different and represent alkyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, or aryl, each being optionally substituted with one or more substituents selected from the group consisting of alkyl, aralkyl, cycloalkyl, cycloalkenyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, aryl, oxo, alkoxycarbonyl, alkylcarbonyloxy, halogen, alkoxy, carboxy, sulfo or
10 hydroxy,
in the presence of a base,
to give a compound of general structure XVIa and/or XVIb,



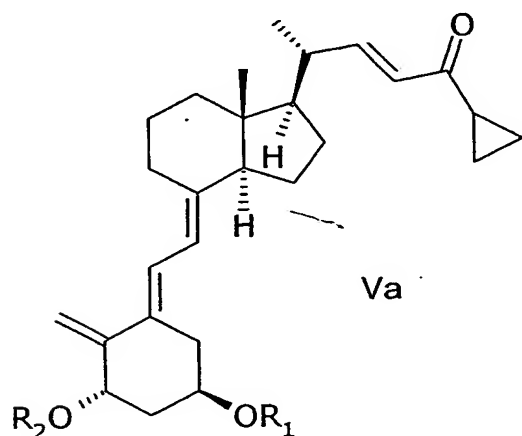
wherein R₁ is as defined above;

(ii) heating the compounds of general structure XVIa and/or XVIb above 60°C in the presence of a base,
to give a compound of general structure XIVa,



5 wherein R_1 is as defined above;

(iii) hydroxylating the compound of general structure XIVa with suitable hydroxylating agent,
to give a compound of general structure Va,



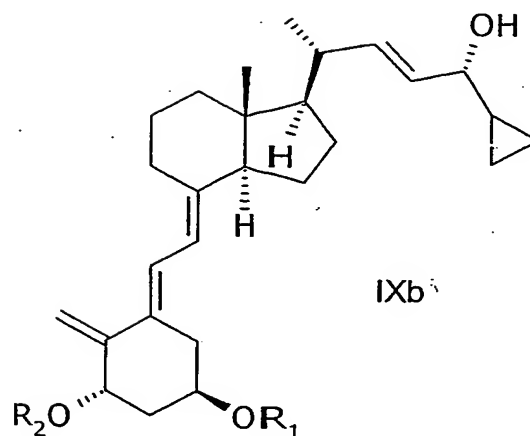
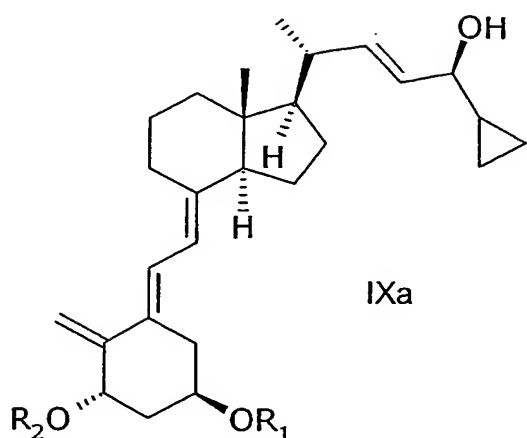
10 wherein R_1 represents hydrogen or a hydroxy protecting group and R_2 is hydrogen;

(iv) optionally reacting the compound of general structure Va, wherein R_1 represents hydrogen or a hydroxy protecting group and R_2 is hydrogen with a suitable protecting agent,

to give a compound of general structure Va, wherein R_1 and R_2 are the same or different

15 and represent a hydroxy protecting group;

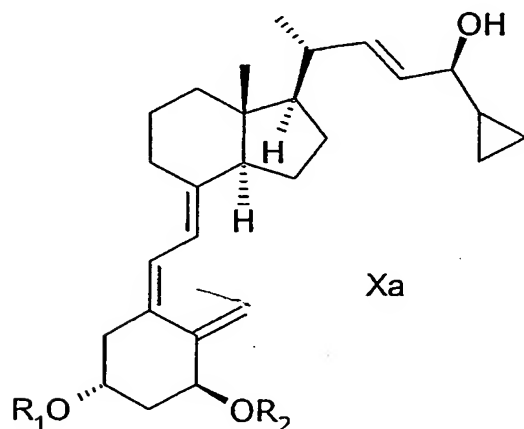
(v) reducing the compound of general structure Va with a suitable reducing agent,
to give a compound of general structure IXa or a mixture of compounds of general structure IXa and IXb,



wherein R_1 and R_2 are as defined above;

(vi) optionally separating the compound of general structure IXa from the mixture of compounds of general structure IXa and IXb;

- 5 (vii) photoisomerising the compound of general structure IXa to the compound of general structure Xa,

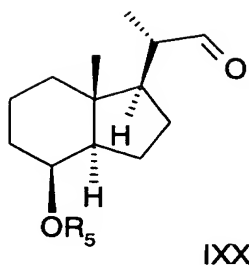


wherein R_1 and R_2 are as defined above;

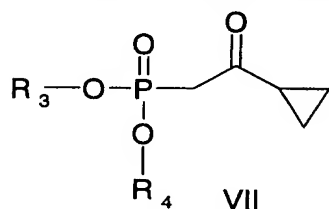
- 10 (viii) when R_1 and/or R_2 are not hydrogen, removing the hydroxy protecting group(s) R_1 and/or R_2 of the compound of general structure Xa to generate calcipotriol; and
 (ix) optionally crystallising the calcipotriol from a mixture of an organic solvent and water to give calcipotriol monohydrate.

- 15 17. A method for producing calcipotriol or calcipotriol monohydrate, the method comprising the steps of:

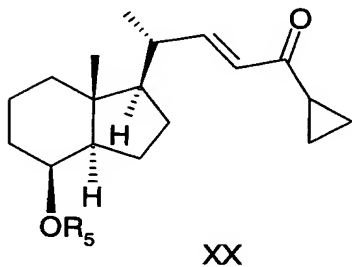
(i) reacting a compound of general structure IXX,



wherein R_5 represents hydrogen or a hydroxy protecting group,
with a phosphonate of general structure VII,

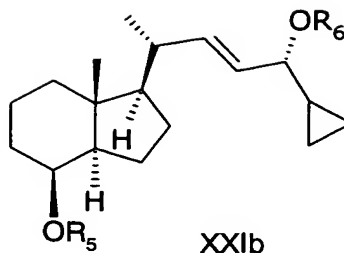
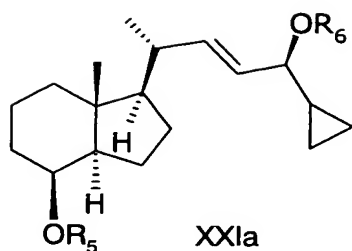


- 5 wherein R_3 and R_4 are the same or different and represent alkyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, or aryl, each being optionally substituted with one or more substituents selected from the group consisting of alkyl, aralkyl, cycloalkyl, cycloalkenyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, aryl, oxo, alkoxycarbonyl, alkylcarbonyloxy, halogen, alkoxy, carboxy, sulfo or
- 10 hydroxy,
in the presence of a base,
to give a compound of general structure XX,



wherein R_5 is as defined above;

- 15 (ii) reducing the compound of general structure XX with a suitable reducing agent,
to give a compound of general structure XXIa or a mixture of compounds of general structure XXIa and XXIb,



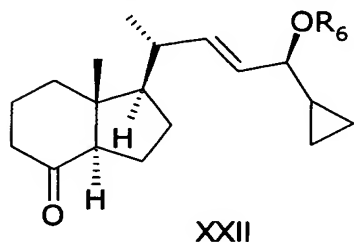
wherein R_5 is as defined above and R_6 is hydrogen;

(iii) optionally separating the compound of general structure XXIIa from the mixture of compounds of general structure XXIIa and XXIIb;

- 5 (iv) protecting the allylic hydroxy group of the compound of general structure XXIIa with a suitable hydroxy protecting reagent, to give a compound of general structure XXIIa, wherein R_6 is a hydroxy protecting group and R_5 is as defined above;

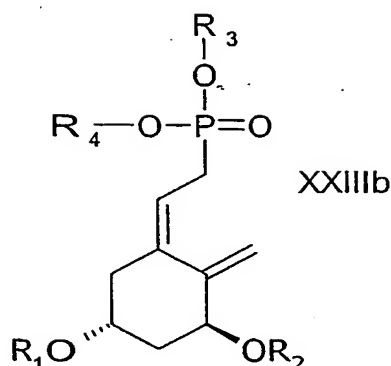
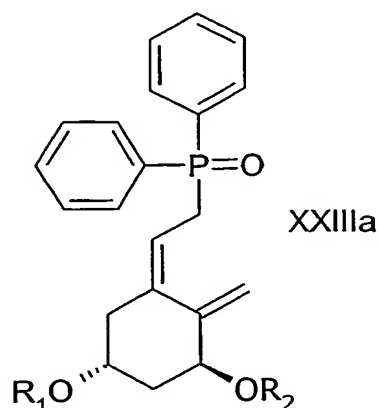
- (v) when R_5 is not hydrogen, removing the hydroxy protecting group R_5 of the compound of general structure XXIIa to give a compound of general structure XXIIa, wherein R_5 is hydrogen;
- 10

(vi) oxidising the hydroxy group of the compound of general structure XXIIa with a suitable oxidising agent to give a compound of general structure XXII,



- 15 wherein R_6 is as defined above;

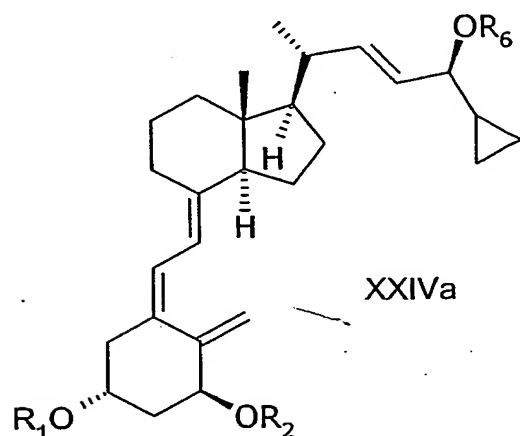
(vii) coupling of the compound of general structure XXII with a Wittig reagent XXIIIa or a Wittig Horner reagent XXIIIb,



wherein R_1 and R_2 represent a hydrogen or a hydroxy protecting group, and wherein R_3 and R_4 are as defined above;

in the presence of a base,

5 to give a compound of general structure XXIVa,



wherein R_1 and R_2 are the same or different and represent hydrogen or a hydroxy protecting group, and wherein R_6 is as defined above;

- 10 (viii) when R_6 is not hydrogen, removing the hydroxy protecting group R_6 of the compound of general structure XXIVa;
- (ix) optionally separating the compound of general structure XXIVa;
- (x) when R_1 and R_2 are not hydrogen, removing the hydroxy protecting group(s) R_1 and R_2 of the compound of general structure XXIVa to generate calcipotriol;
- 15 and
- (xi) optionally crystallising the calcipotriol from a mixture of an organic solvent and water to give calcipotriol monohydrate.

18. The method according to any one of claims 1-17, wherein R_3 and R_4 are (C_1-C_6) alkyl.

19. The method according to any one of claims 1-17, wherein R₃ and R₄ are methyl or ethyl.

5 20. The method according to any one of claims 1-19, wherein R₁ and R₂ represent hydrogen or alkylsilyl.

21. The method according to any one of claims 1-19, wherein R₁ and R₂ represent hydrogen or *tert*-butyldimethylsilyl.

10

22. The method according to claim 8 or 19, wherein R₅ represents triethylsilyl and R₃ and R₄ are methyl or ethyl.

23. The method according to any one of claims 1-22, wherein the reaction with the
15 phosphonate of general structure VII is carried out under phase-transfer conditions.

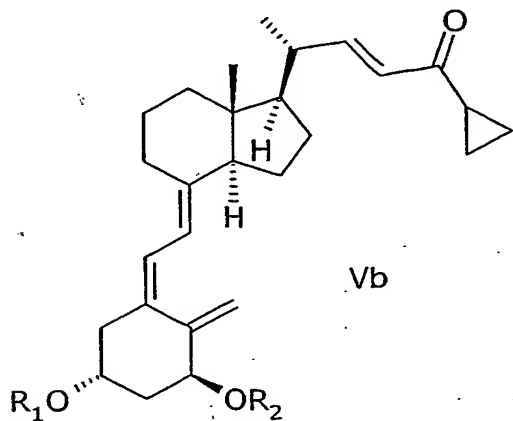
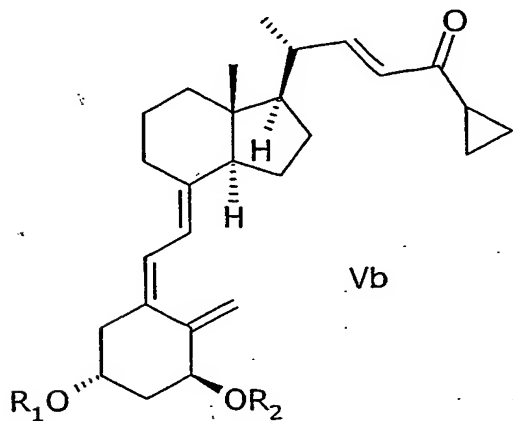
24. The method according to any one of claims 1-22, wherein the reaction with the phosphonate of general structure VII is carried out under phase-transfer conditions in a mixture of toluene or xylene and water with a tetraalkylammonium halide or a tetraalkylammonium hydrogensulfate as the phase transfer catalyst and with an alkalimetal hydroxide and/or a tetraalkylammoniumhydroxide as the base.

20

25. The method according to any one of claims 1-24, wherein the reaction with the phosphonate of general structure VII is carried out at a temperature between 10°C-50°C.

25

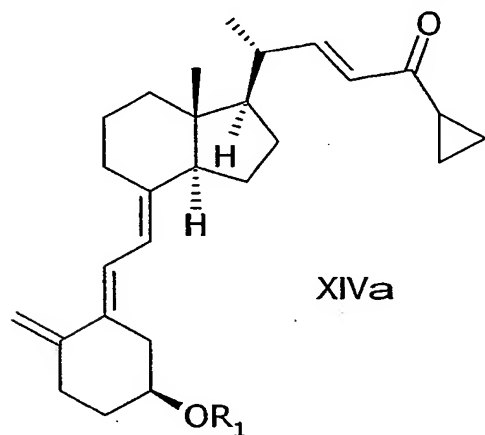
26. A compound of general structure Vb,



wherein R_1 and R_2 are the same or different and each represent a hydroxy protecting group, or R_1 represents hydrogen and R_2 represents a hydroxy protecting group, or R_2 represents hydrogen and R_1 represents a hydroxy protecting group.

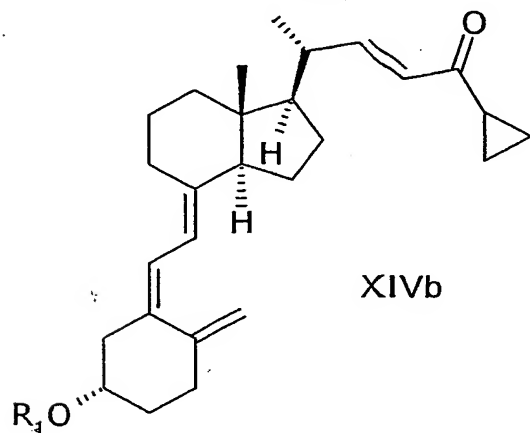
- 5 27. 20(R),1(S),3(R)-bis(*tert*-butyldimethylsilyloxy)-20-(3'-cyclopropyl-3'-oxoprop-1'(E)-enyl)-9,10-secopregna-5(Z),7(E),10(19)-triene.

28. A compound of general structure XIVa,



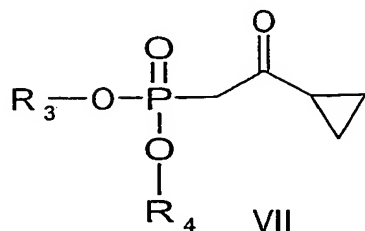
- 10 wherein R_1 represents hydrogen or a hydroxy protecting group, with the proviso that R_1 cannot be *tert*-butyldimethylsilyl.

29. A compound of general structure XIVb,



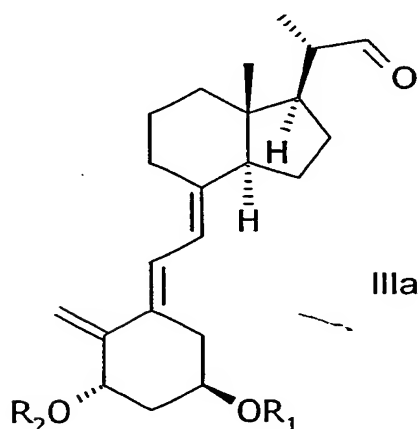
- 15 wherein R_1 represents hydrogen or a hydroxy protecting group.

30. A compound of general structure VII,



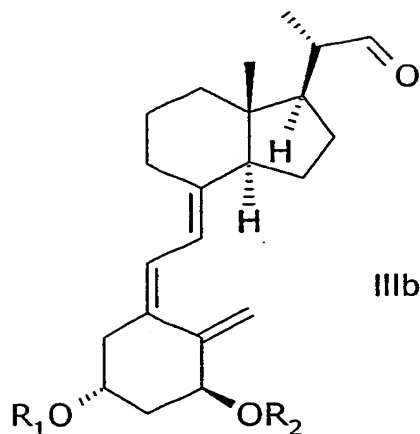
wherein R₃ and R₄ are the same or different and represent alkyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, or aryl, each being optionally substituted with one or more substituents selected from the group consisting of alkyl, aralkyl, cycloalkyl, cycloalkenyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, aryl, oxo, alkoxycarbonyl, alkylcarbonyloxy, halogen, alkoxy, carboxy, sulfo or hydroxy, provided that that the compound is not (2-cyclopropyl-2-oxoethyl)phosphonic acid diethyl ester.

10 31. A compound of general structure IIIa,



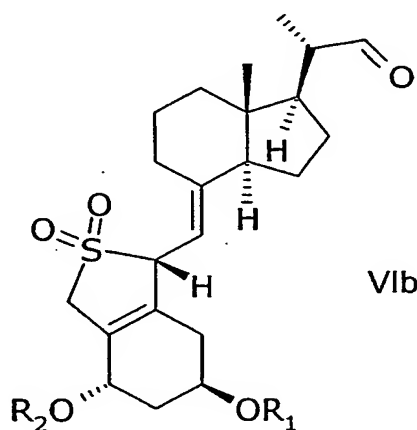
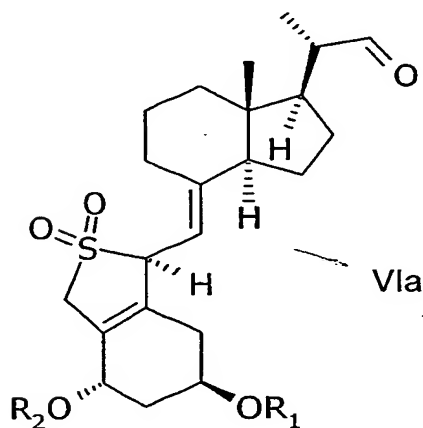
wherein R₁ and R₂ are the same or different and represent hydrogen or a hydroxy protecting group, with the provisos that R₁ and R₂ cannot both be *tert*-butyldimethylsilyl, *tert*-butyldiphenylsilyl, or triisopropylsilyl; with the further proviso that when R₂ is *tert*-butyldimethylsilyl, R₁ cannot be *tert*-butyldiphenylsilyl.

32. A compound of general structure IIb,



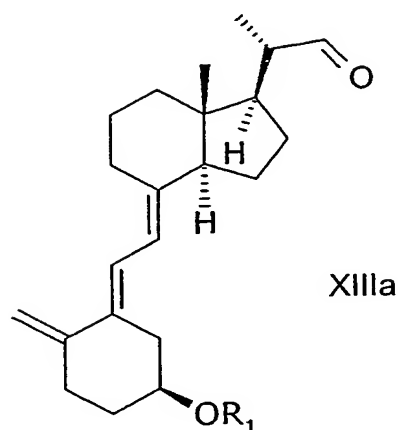
wherein R₁ represents a hydroxy protecting group, and R₂ represents hydrogen or a hydroxy protecting group; or R₁ represents a hydrogen or a hydroxy protecting group, and R₂ represents a hydroxy protecting group, except acetyl; with the proviso that R₁ and R₂ cannot both be *tert*-butyldimethylsilyl.

33. A compound of general structure VIa or VIb,



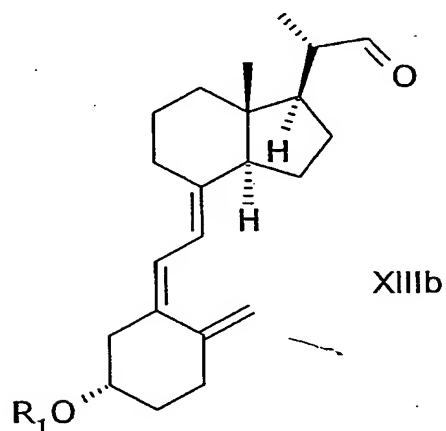
wherein R₁ and R₂ are the same or different and represent hydrogen or a hydroxy protecting group, with the proviso that R₁ and R₂ cannot both be *tert*-butyldimethylsilyl.

34. A compound of general structure XIIIa,



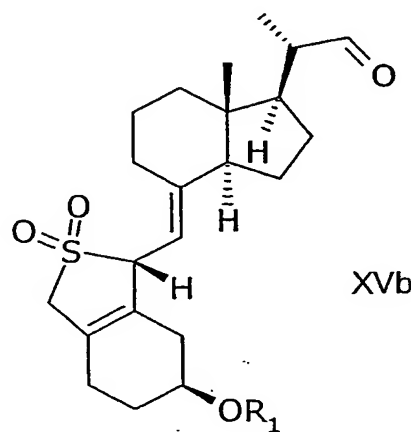
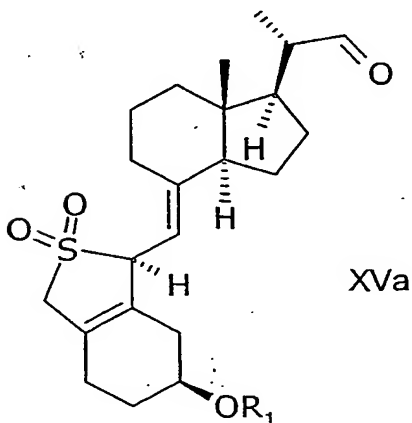
wherein R_1 represents hydrogen or a hydroxy protecting group, except *tert*-butyldimethylsilyl.

- 5 35. A compound of general structure XIIIb,



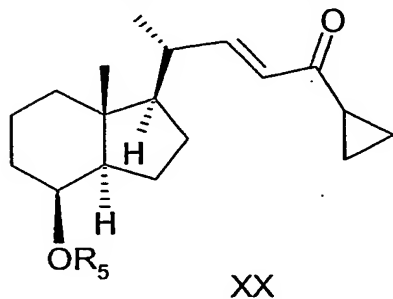
wherein R_1 represents a hydroxy protecting group, except *tert*-butyldimethylsilyl.

36. A compound of general structure XVa or XVb,



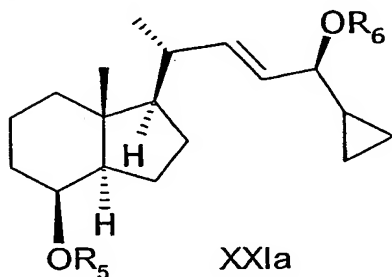
wherein R_1 represents a hydroxy protecting group, except *tert*-butyldimethylsilyl, triisopropylsilyl, acetyl, or triethylsilyl.

37. A compound of general structure XX,



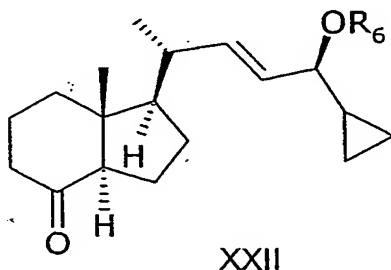
wherein R_5 represents hydrogen or a hydroxy protecting group.

38. A compound of general structure XXIa,



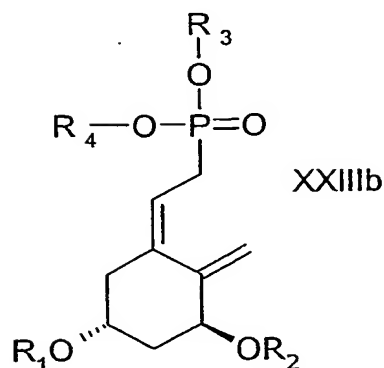
wherein R_5 and R_6 are the same or different and represent hydrogen or a hydroxy protecting group, with the provisos that when R_5 is hydrogen R_6 is not *tert*-butyldimethylsilyl, and when R_5 is benzoate, R_6 is not *tert*-butyldimethylsilyl or hydrogen.

39. A compound of general structure XXII,



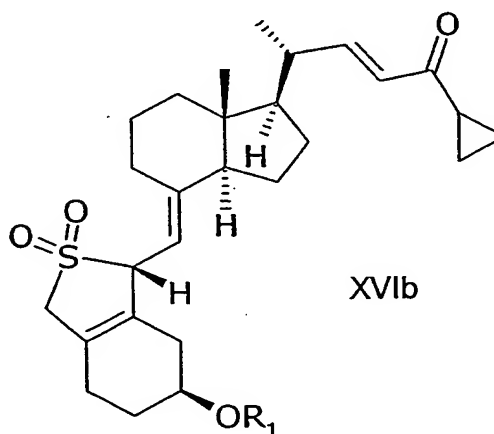
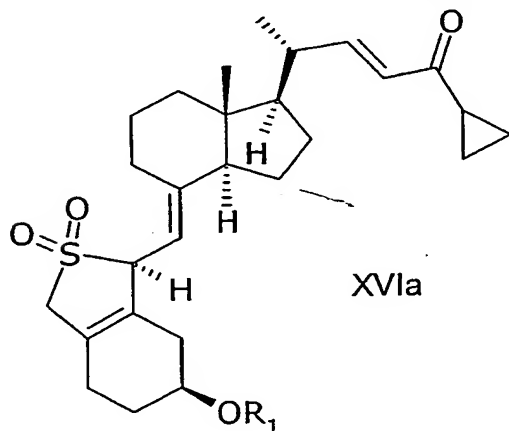
wherein R_6 represents hydrogen or a hydroxy protecting group, except *tert*-butyldimethylsilyl.

40. A compound of general structure XXIIIb,



wherein R_1 and R_2 are the same or different and represent hydrogen or a hydroxy protecting group, and wherein R_3 and R_4 are the same or different and represent alkyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, or aryl, each being optionally substituted with one or more substituents selected from the group consisting of alkyl, aralkyl, cycloalkyl, cycloalkenyl, haloalkyl, hydroxyalkyl, alkenyl, alkynyl, aralkyl, aralkenyl, aralkynyl, aryl, oxo, alkoxy, carbonyl, alkyl, carbonyloxy, halogen, alkoxy, carboxy, sulfo or hydroxy.

41. A compound of general structure XVIa or XVIb,



wherein R_1 represents hydrogen or a hydroxy protecting group.

42. Use of a compound according to any one of claims 26-41 as an intermediate in the manufacture of calcipotriol or calcipotriol monohydrate.

43. Use of (2-cyclopropyl-2-oxoethyl)phosphonic acid diethyl ester in the manufacture of calcipotriol.